

NASA/DoD Aerospace Knowledge Diffusion Research Project

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Summary Report to Phase 1 Respondents

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THE NASA/DOD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT

Report to Phase One Respondents

Introduction

This project, started in 1989, is designed to explore the diffusion of scientific and technical information (STI) throughout the aerospace industry. The increased international competition and cooperation in the industry promises to significantly affect the STI demands of U.S. aerospace engineers and scientists. Therefore, it is important to understand the aerospace knowledge diffusion process itself and its implications at the individual, organizational, national and international levels.

The project is planned in four phases. Phase 1, reported here, is designed to study the information-seeking methods of U.S. aerospace engineers and scientists. Phase 2 is concerned primarily with the transfer of STI in government and industry and the role of librarians and technical information specialists in that transfer. Phase 3 looks at the use of STI in the academic aerospace community. Phase 4 will examine knowledge production, use, and transfer of STI among non-U.S. aerospace organizations and aerospace engineers and scientists.

Part I

Data Collection Methods

In this initial phase of the study, we used three self-administered mailed questionnaires. The respondents' names were randomly drawn from the membership list of the American Institute of Aeronautics and Astronautics (AIAA) and divided into three groups, one for each questionnaire. In Phase 1, we received responses from 3946 AIAA members. The adjusted response rates for the three questionnaires were: Questionnaire One, 67 percent; Questionnaire Two, 63 percent; and Questionnaire Three, 64 percent. The data were collected over a ten month period beginning in May, 1989 and extending to February, 1990.

Description of the Participants

We found that our participants were highly educated. Less than one percent did not have at least a Bachelor's degree. We found that 32 percent had a doctorate and 39 percent had a master's degree. Most worked in an industrial setting (51 percent). The next largest employer (22 percent) was government agencies. Twelve percent of the AIAA members in the sample were working in an academic setting.

The years of professional work experience were broadly spread. Twenty-seven percent of the respondents had ten or fewer years experience. Twenty-one percent had between 11 and 20 years experience and 28 percent had 21 to 30 years experience. About one-quarter (22 percent) had more than 30 years experience.

Most respondents (84 percent) reported that they had been trained as engineers, but only 67 percent classify their current duties as engineering in nature. Twelve percent had been trained as scientists. Less than five percent had neither form of training, but almost a quarter no longer considered their primary duties as engineering or science. The bulk of these respondents described their work as administrative, particularly "technical administrative/management in the profit sector."

Over 80 percent of AIAA members received some federal funding for their research. The federal government supplied the largest portion of research funds for 75 percent of the survey respondents. Private industry supplied about one-fifth of research funds.

Part II

The First Questionnaire

There were 2016 AIAA members who returned the first questionnaire. The questions focused on four information sources used by engineers and scientists: conference and meeting papers, journal articles, in-house technical reports and government technical reports. Most respondents used all four information sources. Over half the participants rated each source as important for their professional duties.

Use and Importance of Information Sources (percents)

Information Sources	Users	Important
Journal Articles	79.4	52.6
In-House Technical Reports	81.0	67.9
Government Technical Reports	79.3	55.2
Conference/Meeting Papers	79.7	54.6

The factors that influenced use of particular information sources varied slightly for each source, but accessibility, relevance and technical quality or reliability were the most important factors for all four information sources. Cost was not an important factor for most of the AIAA members when choosing information sources.

Non-users tended to rate all information sources lower than users did. The most marked differences were reflected in the ratings of accessibility and relevance. Non-users tended to rate each source as substantially less relevant than users and found the sources to be less accessible than users. It is probable that those who do not use a source regularly find it more difficult to access them when they do use them.

The respondents were asked to describe their most important project over the last six months. More respondents (36 percent) reported working on a research project than any other type. A development project was most important for 21 percent. Additionally, most respondents indicated that the primary reason they used one of the four information sources was for research.

We asked respondents to describe the steps they took in locating the information they needed to complete the most important technical project they had finished during the last six months. The survey participants indicated they tended to begin with their personal store of information sources, talk to colleagues informally, and then speak with a supervisor or other key person in their organization. They reported using the library only on the fifth or subsequent step.

Ranking of Steps Taken In Locating Information

Step	Average Rank
Used personal store of technical information	7.59
Discussed the problem with a colleague in organization	7.11
I discussed the problem with a key person in the organization	6.89
Discussed problem with my supervisor	6.68
Intentionally searched library resources	6.16
Searched a data base or had a data base searched	6.13
Discussed the problem with a colleague outside the organization	6.01
Asked a librarian in the organization	5.27
Asked a librarian outside the organization	4.12

Yet most of the participants (65 percent) considered the library to be important. When they did not use a library, it was usually because their needs could be more easily met some other way. The more informal and more immediate information sources were turned to first by the engineers and scientists before using the formal sources.

The Second Questionnaire

The second group (975 respondents) was also asked about their use and rating of various STI sources. Most respondents reported using DoD technical reports (59 percent) and NASA technical reports (74 percent). A smaller portion used AGARD technical reports (32 percent) and technical translations (25 percent). When asked to rate the importance of information sources for performing their professional duties, the AIAA members tended to rate the reports they used the most often as the most important. NASA technical reports and DoD reports were rated important by 51 percent and 41 percent, respectively.

Use and Importance of Information Sources (percents)

Information Source	Users	Important
NASA Technical Reports	73.5	51.0
DoD Technical Reports	58.7	40.9
AGARD Technical Reports	32.2	16.8
Technical Translations	24.5	8.3

Research was the primary reason cited for using these information sources. Management accounted for less than a quarter of the use of the various types of STI, and education accounted for about one-fifth of the use of the information sources. The primary reason cited for not using an information source was the lack of relevance to the respondent's research. Secondary reasons were problems with accessibility and availability. DoD, NASA and AGARD technical report use was influenced by accessibility and relevance.

The participants reported that they found out most often about the NASA and DoD technical reports through citations in reports, journals or conference papers and that they obtained the reports most often by requesting them through the library. Non-users of NASA technical reports gave them much lower ratings in relevance, comprehensiveness and accessibility than users did. Non-users of DoD technical reports did not rate the reports much lower on most qualities than users did. There were much lower marks among non-users on accessibility, however. Surprisingly, non-users rated the DoD reports higher on ease of use than did users, indicating that once a report is obtained, it can be easily used. Actually obtaining the report was the more difficult problem.

The Third Questionnaire

The third questionnaire focused on the participants' use of various bibliographies, databases and other sources of technical information, including STAR, NASA-SP 7037, CAB, GRA&I, RECON, DROLS, and NTIS File. There were 955 respondents. Most respondents did not extensively use many of the data sources we examined. Respondents who did not use the various data sources were, for the most part, not familiar with them.

**Use and Familiarity With
Aerospace Information Databases
(percents)**

Sources	Familiar With Source	Using Source
STAR	41.1	22.4
NTIS	28.2	17.3
RECON	14.8	11.8
NASA SP-7037	15.3	6.4
GRA&I	6.8	3.8
DROLS	5.0	3.7
CAB	5.3	1.7

Respondents who used these information sources reported intermediaries often help them use the sources. Of the 12 percent who used RECON, 47 percent did all searches through intermediaries and 33 percent reported most RECON searches were done through intermediaries. Of those using DROLS (four percent), 53 percent used only intermediaries and 27 percent used intermediaries for most searches. Of the AIAA members who used NTIS File (17 percent), 54 percent reported using an intermediary for all searches and another 24 percent used an intermediary for most searches. The respondents tended to mention inaccessibility and a reliance on others to do these searches as the principal reasons they did not use these databases.

Most respondents (60 percent) rated the results of federally-funded aerospace R&D as very important, and those who did not use it say it was not relevant for the work they did. Problems cited in obtaining federally-funded aerospace R&D related to difficulty in obtaining the information and limitations in the amount of time available to find the information.

Part III

Summary

Phase 1 of the NASA/DoD Aerospace Knowledge Diffusion Research Project is concerned primarily with the way aerospace engineers and scientists obtain and rate the information they need and use for their work. Some broad patterns have emerged.

First, the AIAA members tended to use the STI they gather as part of their research projects. Most of the participants were involved in a major project within the last six months that involved research, design or development. STI is, therefore, crucial to the R & D process in the aerospace industry. Second, our respondents tended to begin with an informal search for information and to use their colleagues as an important information source. They turned to information specialists and librarians primarily when the use of databases was needed. Most or all database searches were conducted through intermediaries. Finally, accessibility, relevance, and technical quality were the most important factors affecting the use of information sources used by the AIAA members. Non-users gave the information sources lower marks in accessibility and relevance.

The study participants tended to regard most of the information sources we examined as important, but they pointed out some barriers to the use of databases in locating STI. Since AIAA members turn to immediate sources first in their searches, we can assume they feel more comfortable with those sources. Sources for which assistance is needed are not as widely used nor as highly regarded. Difficulty of use limits the value of these sources.

ADDITIONAL INFORMATION ON THIS PROJECT

Phase 2 of this project focuses on the role of industry and government information intermediaries, (librarians) and technical information specialists in the transfer of STI. Intermediaries from government and industry libraries with aerospace collections from across the United States and Canada were asked to evaluate many of the information sources reviewed by the AIAA members. In addition, they provided us with information about how information sources are used in their libraries. Analysis of these data is currently being conducted.

Phase 3 of this project focuses on the academic sector of the aerospace community. Questionnaires were sent to undergraduate engineering students and to faculty in aerospace-related departments. Additionally, questionnaires were sent to academic librarians in schools with aerospace programs. Each group was asked to evaluate aerospace STI and how STI is used. Analysis of these data is underway.

Phase 4 began in summer, 1990 with a pilot study in Europe and Japan. A study of aerospace engineers and scientists in Britain is scheduled to begin in February, 1991. Additional surveys in NATO countries and Japan are planned.

We have published a number of project reports and papers, a list of which is included with this report. If you would like additional information about any phase of this study or copies of the reports and papers that examine these data in more detail, please contact:

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We welcome your comments and suggestions.

**NASA/DoD AEROSPACE KNOWLEDGE DIFFUSION
RESEARCH PROJECT PUBLICATIONS**

Reports

- Pinelli, Thomas E.; Myron Glassman; Walter E. Oliu; and Rebecca O. Barclay. **Technical Communications in Aeronautics: Results of an Exploratory Study**. Washington, DC: National Aeronautics and Space Administration. NASA TM-101534, **Report 1, Part 1**. February 1989. 106 p. (Available from NTIS, Springfield, VA; 89N26772.)
- Pinelli, Thomas E.; Myron Glassman; Walter E. Oliu; and Rebecca O. Barclay. **Technical Communications in Aeronautics: Results of an Exploratory Study**. Washington, DC: National Aeronautics and Space Administration. NASA TM-101534, **Report 1, Part 2**. February 1989. 84 p. (Available from NTIS, Springfield, VA; 89N26773.)
- Pinelli, Thomas E.; Myron Glassman; Rebecca O. Barclay; and Walter E. Oliu. **Technical Communications in Aeronautics: Results of an Exploratory Study -- An Analysis of Managers' and Nonmanagers' Responses**. Washington, DC: National Aeronautics and Space Administration. NASA TM-101625, **Report 2**. August 1989. 58 p. (Available from NTIS, Springfield, VA; 90N11647.)
- Pinelli, Thomas E.; Myron Glassman; Rebecca O. Barclay; and Walter E. Oliu. **Technical Communications in Aeronautics: Results of an Exploratory Study -- An Analysis of Profit Managers' and Nonprofit Managers' Responses**. Washington, DC: National Aeronautics and Space Administration. NASA TM-101626, **Report 3**. October 1989. 71 p. (Available from NTIS, Springfield, VA; 90N15848.)
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- Pinelli, Thomas E.; John M. Kennedy; and Terry F. White. **Summary Report to Phase 1 Respondents Including Frequency Distributions**. Washington, DC: National Aeronautics and Space Administration. NASA TM-102773, **Report 5**. January 1991. (Available from NTIS, Springfield, VA.)
- Pinelli, Thomas E. **The Relationship Between the Use of U.S. Government Technical Reports by U.S. Aerospace Engineers and Scientists and Selected Institutional and Sociometric Variables**. Washington, DC: National Aeronautics and Space Administration. NASA TM-102774, **Report 6**. January 1991. 350 p. (Available from NTIS, Springfield, VA.)

Papers

- Pinelli, Thomas E.; Myron Glassman; Rebecca O. Barclay; and Walter E. Oliu. **The Value of Scientific and Technical Information (STI), Its Relationship to Research and Development (R&D), and Its Use by U.S. Aerospace Engineers and Scientists. Paper 1.** Paper presented at the European Forum "External Information: A Decision Tool" 19 January 1990, Strasbourg, France.
- Blados, Walter R.; Thomas E. Pinelli; John M. Kennedy; and Rebecca O. Barclay. **External Information Sources and Aerospace R&D: The Use and Importance of Technical Reports by U.S. Aerospace Engineers and Scientists. Paper 2.** Paper prepared for the 68th AGARD National Delegates Board Meeting, 29 March 1990, Toulouse, France.
- Kennedy, John M. and Thomas E. Pinelli. **The Impact of a Sponsor Letter on Mail Survey Response Rates. Paper 3.** Paper presented at the Annual Meeting of the American Association for Public Opinion Research, Lancaster, PA, May 19, 1990.
- Pinelli, Thomas E. and John M. Kennedy. **Aerospace Librarians and Technical Information Specialists as Information Intermediaries: A Report of Phase 2 Activities of the NASA/DoD Aerospace Knowledge Diffusion Research Project. Paper 4.** Paper presented at the Special Libraries Association, Aerospace Division - 81st Annual Conference, Pittsburgh, PA, June 13, 1990.
- Pinelli, Thomas E.; Rebecca O. Barclay; John M. Kennedy; and Myron Glassman. **Technical Communications in Aerospace: An Analysis of the Practices Reported by U.S. and European Aerospace Engineers and Scientists. Paper 5.** Paper presented at the International Professional Communication Conference (IPCC), Post House Hotel, Guilford, England, September 14, 1990.
- Pinelli, Thomas E. and John M. Kennedy. **Aerospace Knowledge Diffusion in the Academic Community: A Report of Phase 3 Activities of the NASA/DoD Aerospace Knowledge Diffusion Research Project. Paper 6.** Paper presented at the 1990 Annual Conference of the American Society for Engineering Education - Engineering Libraries Division, Toronto, Canada, June 27, 1990.
- Pinelli, Thomas E. and John M. Kennedy. **The NASA/DoD Aerospace Knowledge Diffusion Research Project: The DoD Perspective." Paper 7.** Paper presented at the Defense Technical Information Center (DTIC) 1990 Annual Users Training Conference, Alexandria, VA, November 1, 1990.



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16. Abstract Phase 1 of a four part study was undertaken investigating the use of scientific and technical information (STI) by U.S. aerospace engineers and scientists. Specific attention was paid to institutional and sociometric variables and to the step-by-step process of information gathering used by the respondents. Data were collected by means of three self-administered mail-back questionnaires. The approximately 34,000 members of the American Institute of Aeronautics and Astronautics (AIAA) served as the study population. More than 65 percent of the randomly selected respondents returned the questionnaires in each of the three groups. Respondents relied more heavily upon informal sources of information than formal sources and turned to librarians and other technical information specialists only when they did not obtain results via informal means or their own formal searches.		
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